REMARKS

Claim 17 is cancelled herein. New claims 32 and 33 are added.

I. The Priority Document and the filing date error

The filing date error has previously been corrected as evidenced by the enclosed copy of the latest corrected filing receipt. The assignment was also corrected and acknowledged by the USPTO. Therefore, the filing date is now correct at USPTO, so the priority should be acknowledged in the next USPTO response.

II. An IDS is submitted to show an adaptable mirror and specification rejection at point 8.

DE 26 31 551 is submitted with a translation and fee. The reference discloses an adaptive mirror as discussed at page 9 of the original specification as known in the art. Upon review of the English translation, the Examiner is requested to comment on whether amendment into the specification is necessary to discuss what is well known in the art since 1978. Applicants believe it is not necessary, but are amenable to any suggestion the Examiner may have upon review of the English translation provided with the IDS.

III. The drawing corrections

The drawings have been corrected under separate cover to show the points discussed at paragraph 4. of the Office Action. No new matter added.

The feature of claim 19 is not believed to be necessary to be shown because using such devices is well known in the art.

IV. The specification corrections.

The specification has been corrected to move paragraphs from the summary of invention section to the end of the detailed description section per the Examiner's request. No new matter is added.

V. Claim 17 is cancelled.

VI. The 112 rejections of claims 16-20, 23-26 and 31.

All the issues at paragraph 12 of the Office Action have been addressed herein. No new matter is added. These are not "narrowing" amendments because they are made for the reason to correct typographical errors and conform to U.S. claim format. See new claims 32 and 33 in reference to 12(d) and 12(e) rejections. No new matter is added; support is found in the original claim language.

V. The anticipation rejections of independent claim 16 (and dependent claims 18-20, 26 and 28) in view of Muller.

Claim 16 has been amended to read:

16. (Once amended) A microscope comprising:

two objectives between which a light-transmitting specimen [may be] is arranged;

said objectives having at least [approximately] substantially identical optical characteristics; and

at least one of said two objectives being followed by a mirror for reflecting light transmitted through the specimen back into itself exactly wherein the reflector is placed in the pupil plane of said at least one objective;

a detector for receiving reflected specimen fluorescent radiation from the light transmitting specimen;

wherein a transmitted excitation beam and a fluorescence signal are reflected but the fluorescence signal is reimaged on the detector while the transmitted excitation beam is reflected back into itself exactly with respect to direction and phase front.

This amendment is supported by Figure 2 at Ref. Num. 21, 22 and 23 wherein it is clearly shown that the mirror 23 is placed in the pupil plane of objective 21. Support for the

amendments is also found at page 8 of the specification, see lines 15-17 for example.

In contrast, in Mueller et al, U.S. 4,515,445, as seen in Figure 1, three objective lenses (1, 15, 16) are used and significantly the reflector 17 used to reimage the transmitted light is ***placed in a intermediate image plane.*** This has a couple of disadvantages in comparison to having the reflector located in the pupil plane. Three highly corrected objective lenses are needed and the setup is more susceptible to imperfections on the retroreflector (dusk for instance). Also a correction of the wavefront using the phase conjugate mirror or an adaptive mirror is not possible.

Therefore claim 16 is not anticipated by Muller. The remaining claims depend from claim 16 and therefore they should also be allowable.

VI. The anticipation rejections of independent claim 16 (and dependent claims 18-21, 26 and 31) in view of Ellis.

Ellis et al.:, U.S. 5,035,476, describes a transmission laser scanning microscope setup with a retroreflector as seen in Figure 3 of Ellis. The retroreflector is only used to reflect the excitation laser light back to the illumination lens 61. Fluorescence is only mentioned in column 6, lines 6 through 9. Applicants understanding of the paragraph is that the fluorescence is only collected by lens 61. The retroreflector is only used to reimage the excitation light which is transmitted by the specimen. Therefore the limitation of:

wherein a transmitted excitation beam and a fluorescence signal are reflected but the fluorescence signal is reimaged on the detector while the transmitted excitation beam is reflected back into itself exactly with respect to direction and phase front.

is not taught or anticipated by Ellis. The dependent claims should therefore also be allowable.

In the present invention, the reflected transmitted light is used to improve the excitation efficiency of the fluorescent dye and the contrast/resolution of the optical setup.

VIII. The anticipation rejections of independent claim 16 (and dependent claims 18-20, 23 and 26) in view of Yonezawa.

As discussed above claim 16 is amended. Applicant respectfully asserts that Yonezawa does not teach or suggest the limitations of amended claim 16 as discussed above in detail.

For example, mirror 11 does not result in the pupil plane limitation being met, and there is no disclosure regarding the specific limitations:

wherein a transmitted excitation beam and a fluorescence signal are reflected but the fluorescence signal is reimaged on the detector while the transmitted excitation beam is reflected back into itself exactly with respect to direction and phase front.

IX. The obviousness rejections of the dependent claims.

Given the amendment to claim 16 the obviousness rejections of the dependent claims are no longer on point because all of the limitations of independent claim 16 are not taught or suggested by the cited combinations of references as required by MPEP 706.02(j). It is respectfully asserted that as claim 16 is distinguished and allowable, the dependent claims are therefore also in condition for allowance. Claim 17 is cancelled.

Applicants respectfully note that:

Document B: "Philpot et al.", U.S. 2,660,922
Document C: "Smith et al.", U.S. 2,601,175
Document E: "Lanni et al.", U.S. 5,801,881

Since documents B, C and E all relate to a wide field microscopes and are not relevant to the elected invention.

Therefore, as the obviousness rejection is not provided in complete form, applicants respectfully assert that a prima facie case of obviousness has respectfully not been presented by the reasoning of the office action. In sum, applicants respectfully assert that no discussion of the prima facie case of obviousness requirements required for the combination of references reasoning has been properly presented as required by 35 USC 103 and MPEP 706.02(j).

Specifically, although the Examiner is respectfully believed to be well versed in the

law of obviousness, and combination of references, the relevant law is reproduced below for completeness of the record.

In order to establish a *prima facie* case of obviousness under 35 USC 103 according to section 706.02(j) of the Manual of Patent Examining Procedure (MPEP) the following criteria must be met:

The MPEP Standard for Combining/Modifying References

The Manual of Patent Examining Procedure, section 706.02(j) sets forth the standard for combining and/or modifying prior art, and states:

> To establish a *prima facie* case of obviousness, three basic criteria must be met. **First**, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. **Second**, there must be a reasonable expectation of success. **Finally**, the prior art reference (or references when combined) must teach or suggest all the claim limitations. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art and not based on applicant's disclosure. *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991). See MPEP § 2143 - § 2143.03 for decisions pertinent to each of these criteria. [Bold emphasis provided.]

None of these requirements are respectfully discussed in the rejection which at least respectfully provides insufficient reasoning for an obviousness rejection.

Therefore, it is respectfully asserted the rejection should be withdrawn because a *prima facie* case of obviousness under 35 U.S.C. § 103 and MPEP Section 706.02(j) has not been met by the reasoning of Rejection as required.

The remaining claims depend from claim 16, and therefore the dependent claims are also respectfully believed to be in condition for allowance.

V. Conclusion.

In light of the *FESTO* case, no argument or amendment made herein was related to the statutory requirements of patentability unless expressly stated herein. No claim amendment or argument made was for the purpose of narrowing the scope of any claim unless Applicant has explicitly stated that the argument is "narrowing." It is respectfully requested that all of the claims be reconsidered and allowed. An early and favorable action on the merits is respectfully requested.

Respectfully submitted,

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MARKED-UP SPECIFICATION

At page 2, lines 28-32 to page 3, lines 1-3 of the original specification, please delete the paragraph herein. (see marked up page 2 attached)

Please delete pages 4, 5 and paragraph at page, lines 1-7 of the original specification. (see marked up pages 4, 5, and 6 attached)

At page 6, lines 26-29 through page 7, lines 1-6, please delete the current paragraph and replace it with the following amended paragraph:

--Particularly in fluorescence microscopy, to which the present example pertains, the illumination light proceeding from a light source 6 is reflected through an excitation filter 7 into the [microscope beam path] <u>dichroic beam splitter</u> 8 and impinges on the specimen 1. The fluorescent light which now proceeds from the specimen 1 radiates in the entire solid angle and is accordingly detected by the microscope objective [3] <u>2</u> as well as by objective 3. After traversing the objective 3, the fluorescent light is parallel and impinges on the mirror 5 by which it is reflected back precisely in the focus of the microscope objective 2 and is collected by the microscope objective 2; after passing through the dichroic beam splitter 8, the blocking filter 10 and the eyepiece 11, it is now available for observation (or other evaluation).--

At page 9, line 4, of the original specification, please insert the following paragraphs which were moved from pages 2-6.

--<u>It is possible, and also lies within the scope of this invention, to arrange diaphragms, Wollaston prisms, polarizers or analyzers and/or other subassemblies for optical contrasting in the beam path in a known manner. Any optical contrasting methods by which artificial contrasting can be achieved without harmful intervention in the preparation can be used, i.e., darkfield methods, phase contrast methods in which phase shifts are converted to brightness values, polarization contrast methods for observing birefringent specimens, generation of a differential interference contrast (DIC) and, above all, fluorescence contrasting.</u>

This last embodiment can therefore be applied advantageously above all in fluorescence microscopy because the fluorescent light emitted by the specimen has a very low intensity in comparison to the exciting light. In the suggested manner, the fluorescent light that is not directly detected by the microscope objective can be detected by means of the second objective in the reflecting device and is reflected back again into the focus of the microscope objective. It is collected in the latter and used as an additional basis for detection.

The invention is further directed to a laser scanning microscope in which a light-transmitting specimen is again positioned between two objectives with at least approximately identical optical characteristics and a mirror is arranged following at least one objective, wherein this mirror is constructed as a phase-conjugating or adaptive mirror by which the wavefront of the reflected light is made to coincide with the wavefront of the transmitted light and the light is reflected back into itself exactly with respect to direction and phase front.

In this way, the advantages of the arrangement according to the invention can also be utilized particularly for confocal laser scanning microscopy. Optical scanning in which a light point deflected by oscillating mirrors or rotating polygon prism mirrors sweeps over the object has proven successful in this connection. Pinhole diaphragms conjugated in the illumination and observation beam path ensure that only the light from the respective adjusted focal plane reaches the detector. In this way, spatially resolved and time-resolved data can be obtained in a known manner, but, thanks to the construction of the arrangement according to the invention, with substantially higher efficiency than in the known prior art.

As was already mentioned, the mirror surface of the phase-conjugating mirror is constructed in such a way that the wavefront of a plane wave is changed after being reflected on the mirror surface such that distortions are corrected and the reflected light is reflected back into itself exactly.

On the other hand, the adaptive mirror which can be used alternatively is provided with a deformable mirror surface arranged on a diaphragm, wherein a plurality of individual electrodes are located opposite the diaphragm on its side remote of the mirror surface and

electric voltage is applied to the diaphragm on the one hand and to the electrodes on the other hand; the desired deformation of the diaphragm is triggered by changing the voltages, and accordingly the electrostatic forces, acting between the diaphragm and electrodes.

In this regard, control is carried out depending on the image quality that has been achieved and, as the result of corresponding deformation of the mirror surfaces, causes the light reflected by the mirror to be reflected back exactly in itself and image errors and alignment inaccuracies are compensated.

The adaptive mirror can also be constructed in such a way that the diaphragm is connected, on its side remote of the mirror surface, to a plurality of individual piezoelectric drives and the deformation of the diaphragm is brought about by controlling the piezoelectric drives in different ways.

The electrodes and/or the piezoelectric drives with which the deformable mirror surfaces are coupled can communicate with a detection device via an evaluating unit for a beam component which is coupled out of the observation beam path. The beam component is assessed according to intensity, for example, wherein an intensity signal is obtained and taken as basis for determining an actuating signal for deformation of the mirror diaphragm.

This further development of the inventive idea is applicable in fluorescence microscopy in a particularly preferred manner in that the intensity of the fluorescent radiation proceeding from the specimen is assessed.

In other constructional variants of the invention relating to field-transmitting and scanning systems, the reflecting device can be constructed as a brightfield arrangement having two objectives which together form an optical system with an infinite output intersection length.

Further, it is advantageous, particularly with respect to applications for microphotometry, when the reflecting device can be swiveled out of the microscope beam path and a photomultiplier can be swiveled in in its place for transmitted-light detection. In

this way, no cumbersome modification or adjustments are required for changing to photometric measurements.

Another construction of the field-transmitting and laser scanning microscope consists in that at least one of the objectives is connected with an adjusting device for displacement in axial and/or radial direction and the adjustment is carried out depending on the achieved image quality or intensity and/or contrast. This adjusting possibility is advantageous particularly for adjusting the optical resonator mentioned above. In this case, piezomechanical drive elements above all have proven successful as actuating drives.

However, this possibility of axial and/or radial adjustment serves not only for the adjustment of the optical resonator, but also opens the door to more or less novel contrasting methods, especially when adjustment accuracies in the submicrometer range, preferably in the range of several hundred nm, are realized. Such accuracy can readily be achieved with piezo actuating elements, and phase interference and differential interference contrasting methods can be further developed in this way in terms of their efficiency.--

MARKED-UP CLAIMS

All of the claims whether amended or not are provided for the Examiner's convenience.

Please cancel claim 17.

16. (Once amended) A microscope comprising:

two objectives between which a light-transmitting specimen [may be] is arranged;

said objectives having at least [approximately] substantially identical optical characteristics; and

at least one of said two objectives being followed by a mirror for reflecting light transmitted through the specimen back into itself exactly wherein the reflector is placed in the pupil plane of said at least one objective; New matter

a detector for receiving reflected specimen flourescent radiation from the light transmitting specimen;

wherein a transmitted excitation beam and a fluorescence signal are reflected but the fluorescence signal is reimaged on the detector while the transmitted excitation beam is reflected back into itself exactly with respect to direction and phase front.

18. (Once amended) The microscope according to claim 16, with incident illumination and field transmission of [the] an image information, wherein one of the objectives serves as a microscope objective and the second objective is part of a reflecting device through which the specimen is imaged onto itself with lateral and vertical accuracy.

19. (Once amended) The microscope according to claim 16, wherein diaphragms, Wollaston prisms, polarizers [and/or other] or subassemblies for optical contrasting are arranged in [the] a beam path.

20. The microscope according to claim 16, but with a coherent illumination source in which one of the mirrors is constructed as a phase-conjugating mirror.

21. The microscope according to claim 16, wherein a dichroic beam splitter is provided for reflecting into the illumination source.

22. The microscope according to claim 16, wherein another mirror is provided between the microscope objective and eyepiece, the specimen being imaged on this mirror through the microscope objective, wherein this mirror passes the illumination beam but does not pass a selected beam component, preferably fluorescent radiation, coming from the specimen.

23. The microscope according to claim 16, constructed as a laser scanning microscope, wherein one of the objectives serves as a microscope objective and the second objective is part of a reflecting device having a phase-conjugating mirror or an adaptive mirror by which the wavefront of the reflected light is made to coincide with the wavefront of the transmitted light.

24. (Once amended) The microscope according to claim 23, wherein the adaptive mirror (23) is provided with a deformable mirror surface arranged on a diaphragm, and a plurality of individual electrodes are located opposite the diaphragm on its side remote of the mirror surface , and electric voltage is applied to the diaphragm on the one hand and to the electrodes on the other hand, and the deformation of the diaphragm is brought about by changing the voltages and electrostatic forces acting between the diaphragm and electrodes [, or the diaphragm is connected, on its side remote of the mirror surface, to a plurality of individual piezoelectric drives and the deformation of the diaphragm is brought about by controlling the piezoelectric drives in different ways].

25. (Once amended) The microscope according to claim 24, wherein the electrodes [and/or the piezoelectric drives] communicate with a detection device for a beam component which is coupled out of [the] <u>an</u> observation beam path, with fluorescent radiation proceeding from the specimen.

26. The microscope according to claim16, wherein the reflecting device is constructed as a brightfield arrangement having two objectives which together form an optical system with an infinite output intersection length.

27. The microscope according to claim 16, wherein the reflecting device can be swiveled out of the microscope beam path and a photomultiplier can be swiveled in its place for transmitted-light detection.

28. (Once amended) The microscope according to claim 16, wherein at least one of the objectives is connected with adjusting devices for displacement in axial and/or radial direction and the adjustment is carried out depending on [the assessment of] the observation beam path with respect to its intensity [and/or] <u>or</u> contrast.

29. The microscope according to claim 27, wherein the adjusting devices are coupled with drive elements.

30. The microscope according to claim 27, wherein said drive elements are piezomechanical drive elements.

31. (Once amended) The microscope according to claim 16, wherein there is a detector for a beam component which is coupled out of [the] <u>an</u> observation beam path, with fluorescent radiation proceeding from the specimen.

Please add the following new claims:

32. (New) The microscope according to claim 23, wherein the adaptive mirror is provided with a deformable mirror surface arranged on a diaphragm, the diaphragm is connected, on its side remote of the mirror surface, to a plurality of individual piezoelectric drives and the deformation of the diaphragm is brought about by controlling the piezoelectric drives.

33. (New) The microscope according to claim 32, wherein the piezoelectric drives communicate with a detection device for a beam component which is coupled out of the observation beam path, with fluorescent radiation proceeding from the specimen.

add 037

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MARKED UP SPECIFICATION

for example, two objectives with infinite output back focal distance or output intersection length, wherein the object plane and the surface of the plane mirror lie in the focal point of the two objectives.

However, the reflection carried out in this manner also has alignment inaccuracies and image errors, as a result of which the light is not exactly parallel after the second objective or the object to be observed is not imaged onto itself with lateral and vertical precision.

On this basis, it is the object of the invention to increase efficiency in reflection and to ensure that the transmitted incident light is reflected back in itself again with high accuracy by the reflecting device.

According to the invention, this object is met in a microscope in which a specimen is positioned between two objectives having optical characteristics that are as identical as possible and at least one of the two objectives is followed by a mirror which reflects the light transmitted through the specimen back into itself exactly, so that there is optimum illumination when light is transmitted twice through the preparation. The image of the entire specimen volume obtained in this way can be observed in the observation beam path of a microscope with field-transmitting operation, wherein one of the two objectives serves as a microscope objective and the second objective is part of a reflecting device.

The reflector surface of the mirror which is arranged subsequent to the reflecting objective is not plane as is the case in the prior art, but has a spherical curvature which, to a first approximation, is adapted to the wavefront of the reflecting objective. The reflector surface is preferably curved aspherically and is accordingly adapted to the output wavefront of the reflecting objective.

In a particularly preferred embodiment of the invention, the two objectives have the same numerical aperture (NA) and also conform to one another as far as possible with respect to other characteristics, wherein both objectives are preferably constructed as planaprochromats with a NA greater than or equal to 1.4.

It is possible, and also lies within the scope of this invention, to arrange diaphragms, Wollaston prisms, polarizers or analyzers and/or other subassemblies for optical contrasting in the beam path in a known manner. Any optical contrasting methods by which artificial contrasting can be achieved without harmful intervention in the preparation can be used, i.e., darkfield methods, phase contrast methods in which phase shifts are converted to

brightness values, polarization contrast methods for observing birefringent specimens, generation of a differential interference contrast (DIC) and, above all, fluorescence contrasting.

In another possible embodiment of the invention, there is a coherent illumination source and the mirror provided in the reflecting device is constructed as a phase-conjugating mirror. Random disturbances are optimized in real time with the phase conjugation in that an electromagnetic wave is generated at the phase-conjugating mirror surface, which electromagnetic wave not only propagates in the opposite direction, as is desired, but, beyond this, also has a reversed phase distribution or an opposite sign of the phase.

Accordingly, in contrast to the conventional mirror, the distortion of the wavefront is corrected, as a result of which the light is imaged through the second objective again exactly in the focus of the microscope objective. Compensation of losses which still occur in the prior art due to imaging errors and alignment inaccuracies is substantially improved in this way.

When a laser source is used for illumination in connection with the construction according to the invention, nonlinear phenomena can be utilized very favorably because the probability of multiphoton absorption is substantially increased due to the bundling of the laser light when passing through the specimen two times. When the laser light is coupled into the microscope beam path via a dichroic beam splitter, the doubled wavelength which is diffusely reflected by the specimen can be observed in a simple manner.

It also lies within the scope of the invention to provide another mirror and to position this other mirror between the microscope objective and eyepiece in such a way that the specimen is imaged on this mirror through the microscope objective. This constructional variant is especially relevant for fluorescence microscopy, wherein this mirror passes the illumination beam but does not pass a selected beam component coming from the specimen, e.g., the fluorescence radiation.

With an arrangement of this type, the two objectives which are located opposite one another symmetrically with respect to the specimen with homogeneous immersion advantageously form an optical resonator by which very small phase interferences introduced in the resonator by the specimen can be detected and can accordingly provide information about the specimen with high resolution.

This last embodiment can therefore be applied advantageously above all in fluorescence microscopy because the fluorescent light emitted by the specimen has a very low intensity in comparison to the exciting light. In the suggested manner, the fluorescent light that is not directly detected by the microscope objective can be detected by means of the second objective in the reflecting device and is reflected back again into the focus of the microscope objective. It is collected in the latter and used as an additional basis for detection.

The invention is further directed to a laser scanning microscope in which a light-transmitting specimen is again positioned between two objectives with at least approximately identical optical characteristics and a mirror is arranged following at least one objective, wherein this mirror is constructed as a phase-conjugating or adaptive mirror by which the wavefront of the reflected light is made to coincide with the wavefront of the transmitted light and the light is reflected back into itself exactly with respect to direction and phase front.

In this way, the advantages of the arrangement according to the invention can also be utilized particularly for confocal laser scanning microscopy. Optical scanning in which a light point deflected by oscillating mirrors or rotating polygon prism mirrors sweeps over the object has proven successful in this connection. Pinhole diaphragms conjugated in the illumination and observation beam path ensure that only the light from the respective adjusted focal plane reaches the detector. In this way, spatially resolved and time-resolved data can be obtained in a known manner, but, thanks to the construction of the arrangement according to the invention, with substantially higher efficiency than in the known prior art.

As was already mentioned, the mirror surface of the phase-conjugating mirror is constructed in such a way that the wavefront of a plane wave is changed after being reflected on the mirror surface such that distortions are corrected and the reflected light is reflected back into itself exactly.

On the other hand, the adaptive mirror which can be used alternatively is provided with a deformable mirror surface arranged on a diaphragm, wherein a plurality of individual electrodes are located opposite the diaphragm on its side remote of the mirror surface and electric voltage is applied to the diaphragm on the one hand and to the electrodes on the other hand; the desired deformation of the diaphragm is triggered by changing the

voltages, and accordingly the electrostatic forces, acting between the diaphragm and electrodes.

In this regard, control is carried out depending on the image quality that has been achieved and, as the result of corresponding deformation of the mirror surfaces, causes the light reflected by the mirror to be reflected back exactly in itself and image errors and alignment inaccuracies are compensated.

The adaptive mirror can also be constructed in such a way that the diaphragm is connected, on its side remote of the mirror surface, to a plurality of individual piezoelectric drives and the deformation of the diaphragm is brought about by controlling the piezoelectric drives in different ways.

The electrodes and/or the piezoelectric drives with which the deformable mirror surfaces are coupled can communicate with a detection device via an evaluating unit for a beam component which is coupled out of the observation beam path. The beam component is assessed according to intensity, for example, wherein an intensity signal is obtained and taken as basis for determining an actuating signal for deformation of the mirror diaphragm.

This further development of the inventive idea is applicable in fluorescence microscopy in a particularly preferred manner in that the intensity of the fluorescent radiation proceeding from the specimen is assessed.

In other constructional variants of the invention relating to field-transmitting and scanning systems, the reflecting device can be constructed as a brightfield arrangement having two objectives which together form an optical system with an infinite output intersection length.

Further, it is advantageous, particularly with respect to applications for microphotometry, when the reflecting device can be swiveled out of the microscope beam path and a photomultiplier can be swiveled in in its place for transmitted-light detection. In this way, no cumbersome modification or adjustments are required for changing to photometric measurements.

Another construction of the field-transmitting and laser scanning microscope consists in that at least one of the objectives is connected with an adjusting device for displacement in axial and/or radial direction and the adjustment is carried out depending on the achieved image quality or intensity and/or contrast. This adjusting possibility is advantageous particularly for adjusting the optical resonator mentioned above. In this case,

piezomechanical drive elements ~~above all have proven successful as actuating~~ drives.

However, this possibility of axial and/or radial adjustment serves not only for the adjustment ~~of the optical resonator, but also~~ opens the door to more or less novel contrasting methods, especially when adjustment accuracies in the submicrometer range, preferably ~~in the range of several hundred nm, are realized.~~ Such accuracy can readily be achieved with piezo actuating elements, and phase interference and differential interference ~~contrasting methods can be further~~ developed in this way in terms of their efficiency.

The invention will be described more fully in the following with reference to two embodiment examples. In the accompanying drawings:

Fig. 1 shows the arrangement according to the invention in a field-transmitting microscope;

Fig. 2 shows the arrangement according to the invention in a confocal laser scanning microscope.

In Fig. 1, a specimen 1 is received between the microscope objective 2 and another objective 3 which is identical to the microscope objective 2 with respect to its optical characteristics and which is part of a reflecting device 4. Optimum resolutions result when, for example, planaprochromats with a numerical aperture greater than or equal to 1.4 are used for both objectives 2, 3.

It is further advantageous when the preparation is received between two identical, high-grade cover glasses which ensure a perfectly symmetrical beam path.

A mirror 5 which reflects the light transmitted through the specimen 1 back into itself exactly is arranged in the reflecting device 4 following the objective 3. The reflecting surface of the mirror 5 is not plane, but rather has a sphere which is adapted to the wavefront of the objective 3 to a first approximation. In a particularly preferred manner, the mirror surface is curved aspherically and adapted to the output wavefront of the objective 3.

Particularly in fluorescence microscopy, to which the present example pertains, the illumination light proceeding from a light source 6 is reflected through an excitation filter 7 into the microscope beam path 8 and impinges on the specimen 1. The fluorescent light which now proceeds from the specimen 1 radiates in the entire solid angle